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Donald F. Haas
Date: March 15, 2006

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE
BEFORE THE BOARD OF APPEALS AND INTERFERENCES

In re the accompanying application of	)	
	)	
ARIE VAN ZON, ROBERT MOENE, PHILLIP E. UNGER, PETER ARNOLDY, and ERIC J. M. DE BOER	)	
	)	
Serial No. 10/668,933	)	Group Art Unit: 1764
	)	
Filed September 23, 2003	)	Examiner: Thuan D. Dang
	)	
PROCESS FOR MAKING A LINEAR ALPHA-OLEFIN OLIGOMER USING A HEAT EXCHANGER	)	March 15, 2006

COMMISSIONER FOR PATENTS
P. O. Box 1450
Alexandria, VA 22313-1450

Sir:

BRIEF ON APPEAL TO THE BOARD OF PATENT APPEALS AND INTERFERENCES

The Appellants filed a Notice of Appeal from the final rejection of claims 1-16 of the Primary Examiner dated October 19, 2005. Please charge the $500 fee for this brief to Shell Oil Company Deposit Account No. 19-1800.

Real Party in Interest

The Real Party in Interest in this appeal is the Assignee, Shell Oil Company.

Related Appeals and Interferences

There is a prior and pending appeal known to the Appellants, the Appellants' legal representative, and Assignee which may be related to, directly affect or be directly affected by or

have a bearing on the Board's decision in the pending appeal. This application is Serial No. 10/668,934, filed September 23, 2003 and the appeal brief was filed on October 28, 2005. The inventors in that case and the present case are the same.

Status of Claims

Claims 1 through 25 were presented for examination. Pursuant to a restriction requirement, claims 17 through 25 were withdrawn and claims 1 through 16 were elected for prosecution in this application. In the Amendment of July 22, 2005, claim 1 was amended to insert the phrase, "positioned in the gas phase in the reactor but" in the penultimate line of claim 1.

Summary of Amendments

No amendments have been filed subsequent to the final rejection of October 19, 2005.

Summary of Claimed Subject Matter

The claimed invention is a process for making a linear alpha olefin oligomer in a reactor which must have both a liquid and a gas phase. The process comprises the steps of oligomerizing ethylene in the presence of a catalyst complex, which is selected from the group consisting of iron complexes, to an alpha olefin oligomer in a reaction which involves the release of heat. The heat is removed with a heat exchanger which is not in direct contact with the liquid phase and uses at least part of the gas phase as a coolant medium (page 3, line 33 to page 4, line 9 of the specification). The claims as amended require that the heat exchanger be positioned in the gas phase inside the reactor (page 5, lines 1-5, of the specification). The liquid reaction medium is required in the present invention (page 4, line 1, and line 11, of the specification). Some reaction may take place in the gas phase but the primary reaction medium is a liquid reaction medium (page 9, lines 9-14, of the specification). It is important that the cooling system have its cooling element outside of the liquid reaction medium to avoid the deposit of wax and polyethylene on the heat exchanger (page 4, lines 10-14, of the specification).

Grounds of Rejection to be Reviewed on Appeal

The first ground of rejection stated in the Final Rejection of October 19, 2005, is that claims 1-16 have been rejected under 35 U.S.C. 103(a) as being unpatentable over Gibson et al. in view of Hinton et al. The Examiner concluded that it would have been obvious to one having ordinary skill in the art at the time the invention was made to modify the Gibson process by

moving the heat exchanger from outside to inside of the reactor since Hinton teaches that a reactor having an inside heat exchanger outperforms the same with an outside heat exchanger. Appellants hereby appeal this rejection.

The second round of rejection is that claims 1-16 have been provisionally rejected under the judicially created doctrine of obviousness-type double patenting over claims 1-21 of copending application No. 10/668,592 in view of Hinton et al.

Argument

The Section 103 Rejection of Claims 1-16

The Examiner's rejection is based upon the incorrect premise that Gibson et al. disclose a process for the polymerization of ethylene in a reactor containing, along with ethylene and a catalyst, a liquid phase and a gas phase which is heat exchanged. This premise is incorrect.

On page 3 of the Final Rejection of October 19, 2005, the Examiner cites several sections of the Gibson reference in support of the premise. The abstract of Gibson et al. contains no reference whatsoever to heat exchange and nor does any of the text following that reference up to page 12. The Examiner's reference at page 12 of the specification of Gibson et al. does describe cooling a fluidized bed by addition of cool gas (recycled gaseous monomer) at lines 16 and 17 but this is only in connection with a gas phase polymerization process (see line 10 of page 12 of Gibson et al.). Again, the reference given by the Examiner to page 13 of Gibson et al. does discuss heat exchange at lines 22-23 but only in connection with a gas phase fluidized bed process (see line 10 of page 13 of Gibson et al.).

There are only four types of reaction processes for producing ethylene polymers discussed in Gibson et al. These are described at page 9, lines 17-18, of Gibson et al. as solution phase, slurry phase, gas phase, or bulk phase. Solution phase polymerization is carried out exactly as is implied, i.e., in solution. Slurry phase polymerization is carried out exactly as is implied, i.e., in a slurry. Gas phase polymerization is carried out exactly as is implied, i.e., in gas phase. There is nothing at all in Gibson et al. which suggests or implies that any reaction takes place in a system which has both a discrete liquid phase where most of the reaction takes place and also a discrete gas phase from which unreacted reaction components and some reaction products may be condensed.

Furthermore, the only specific description of polymerization processes given in Gibson et al. are of slurry and gas phase processes. The slurry process is described beginning at page 10, line 26 through page 12, line 7. The gas phase process description begins at page 12,

line 10 of Gibson et al. On page 12, lines 8-9 of Gibson et al., there is a statement that in a bulk polymerization process, the liquid monomer is used as the polymerization medium. Thus, bulk polymerization is also an entirely liquid phase reaction.

Up to this point in Gibson et al. (up through page 12, line 9), the reference contains no description or discussion or hint of heat exchange. The only discussion of heat exchange is in the gas phase polymerization process description (beginning at page 12, line 10). Earlier in the prosecution, the Examiner made the statement that a gas phase reaction must contain liquid. This statement is incorrect and is entirely inconsistent with the gas phase process in Gibson et al. At page 12, lines 18-20, Gibson et al. describe the gas phase process as being free from, or substantially free of liquid. At page 12, lines 18-25, Gibson et al. defines the gas phase process as the formation of a solid in a polymerization zone directly from a gas and free from liquid. There is no liquid phase reaction medium and no condensation of the gas phase in the gas phase process described in Gibson et al.

In the final rejection, the Examiner states that "Hinton discloses a polymerization process having a reactor containing a heat exchanger in the gas phase of the reactor . . ." The Examiner's description of Hinton et al. is incomplete. Hinton et al. teach a process for the polymerization of conjugated dienes. A heat exchanger is placed in the gas phase in order to condense the gas phase and thus cool the liquid reaction medium. The products of this reaction are conjugated diene polymers.

The Examiner does not provide any motivation for one of ordinary skill in the art to combine these two references and for this reason alone, the rejection is deficient since the Examiner must provide the appropriate motivation to combine the references. The Appellants assert that Gibson et al. and Hinton et al. may not be properly combined because there is no motivation for combining them. The two references disclose entirely different polymerization processes. The reaction mechanism described in Gibson et al. is entirely different from the reaction mechanism described in Hinton et al. since the former reference describes a reaction which takes place in the gas phase and the latter reference describes a reaction which takes place in the liquid phase. There is no reason provided in either of the references why one would make use of a reaction scheme used in the polymerization of conjugated dienes in a process for oligomerizing ethylene. Furthermore, the use of and description of heat exchange in Gibson et al. in the gas phase is much different than the description of and the use of heat exchange described in Hinton et al. The references simply do not provide anything in their disclosures which would motivate one of ordinary skill in the art to combine them to come up with a process for the oligomerization of ethylene. Appellants request that the Section 103 rejection of claims 1-16 be overturned.

The Obviousness-type Double Patenting Rejection of Claims 1-16

The double patenting rejection should also be overturned. First of all, claims 1-12 of the copending application describe a catalyst and thus cannot have any relevance at all to a process for making linear alpha olefin oligomer in a reactor comprising a liquid phase and a gas phase, much less such process wherein a heat exchanger is positioned in the gas phase in the reactor but not in direct contact with the liquid phase. The rest of the claims are process claims. Claim 13 is as follows:

> "a process for the production of alpha-olefins comprising reacting ethylene under oligomerization conditions in the presence of an effective amount of the catalyst system of claim 1."

What connection at all is there between the above claim and the specifics of the polymerization process described by Hinton? The Appellants assert that there is none because Hinton describes a process for the polymerization of conjugated dienes. The Examiner has failed to show that there is any connection between a process for polymerizing conjugated dienes and a process for the production of alpha olefins (not alpha olefin polymers) which comprises reacting ethylene under oligomerization conditions in the presence of the catalyst of claim 1 of the copending application.

The Appellants assert that the double patenting rejection cannot be sustained because there is no connection between the two references.

Conclusion

The Appellants assert that the arguments presented above overcome the rejections of claims 1-16.

Respectfully submitted,

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CLAIMS APPENDIX

1. A process for making a linear alpha-olefin oligomer in a reactor comprising a liquid and a gas phase, comprising the steps of catalytically oligomerizing ethylene in the presence of an iron complex of a 2,6-bis(arylimino)pyridine derivative, to an alpha-olefin oligomer under release of heat, and removing the heat with a heat exchanger which is positioned in the gas phase in the reactor but not in direct contact with the liquid phase, using at least part of the gas phase as a coolant medium.

2. The process of claim 1 wherein an aluminum-based co-catalyst is added to the liquid phase.

3. The process of claim 2 wherein the aluminum-based co-catalyst is an aluminoxane selected from the group consisting of methyl aluminoxane, alkyl-modified methyl aluminoxane, and mixtures thereof.

4. The process of claim 3 wherein the aluminum-based co-catalyst is a methyl aluminoxane.

5. The process of claim 1 wherein the oligomer is an alpha-olefin oligomer with an average molecular weight between about 50 and about 350.

6. The process of claim 5 wherein the average molecular weight is between about 60 and about 280.

7. The process of claim 6 wherein the average molecular weight is between about 80 and about 210.

8. The process of claim 2 to which is added a second co-catalyst compound which comprises one or more compounds of the formula ZnR'_2 wherein each R', which may be the same or different, is selected from hydrogen, optionally substituted C_1-C_{20} hydrocarbyl, phenyl, F, Cl, Br, I, SR", $NR"_2$, OH, OR", CN, NC wherein R", which within the same molecule may the same or different, is C_1-C_{20} hydrocarbyl.

9. The process of claim 8 wherein R' is C_1-C_{20} hydrocarbyl.

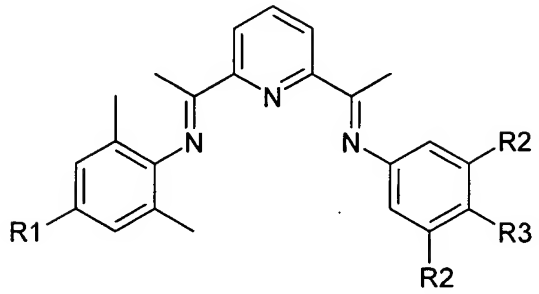
10. The process of claim 9 wherein R' is C_1-C_{20} alkyl.

11. The process of claim 10 wherein R' is C_1-C_6 alkyl.

12. The process of claim 11 wherein R' is ethyl.

13. The process of claim 1 wherein one of the aryl moieties of the 2,6-bis(arylimino)pyridine derivative is 2,6-disubstituted with the group CH_2R or C_2H_5R, wherein R is selected from H and F, and the other aryl moiety is 2,6-unsubstituted, or wherein both aryl moieties of the 2,6-bis(arylimino)pyridine derivative are 2,6-disubstituted with F or Cl.

14. The process of claim 1 wherein the 2,6-bis(arylimino)pyridine derivative has the formula:

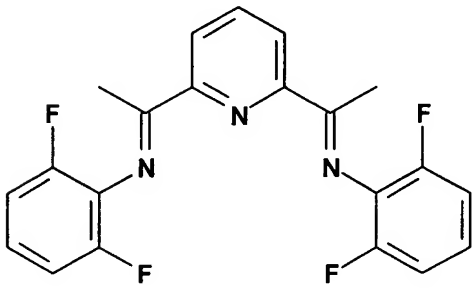


wherein

R1 is H or CH_3;

R2 is H, tert-butyl or phenyl and

R3 is H, tert-butyl or OR' wherein R' stands for CH_3, $Si(CH_3)_3$ or eicosyl ($C_{20}H_{41}$); or



15. The process of claim 1 wherein the coolant medium is selected from the group consisting of an alkane, an alkene, and an aromatic compound, and mixtures thereof.

16. The process of claim 1 wherein the coolant medium is selected from the group consisting of propane, n-pentane, isopentane, ethylene, 1-butene, o-, m-, and p-xylene, and toluene, and mixtures thereof.

RELATED APPEALS APPENDIX

There is a prior and pending appeal known to the Appellants, the Appellants' legal representative, and Assignee which may be related to, directly affect or be directly affected by or have a bearing on the Board's decision in the pending appeal. This application is Serial No. 10/668,934, filed September 23, 2003 and the appeal brief was filed on October 28, 2005. The inventors in that case and the present case are the same.